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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/847,511	05/02/2001	Yu-Hsi Wang	67,200-404	7868

7590 04/04/2003

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EXAMINER
KORNAKOV, MICHAIL

ART UNIT	PAPER NUMBER
1746	4

DATE MAILED: 04/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/847,511	WANG ET AL.	
	Examiner	Art Unit	
	Michael Kornakov	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *27 January 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Applicants' remarks in Paper No.3, filed 01/27/2003, are noticed.

2. Claims 1-20 are currently pending in the Application.

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1, 2, 5, 6, 9, 15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505).

Komatsuzaki teaches apparatus for any liquid treatment of a wafer and a method of treatment, utilizing the said apparatus. The apparatus of Komatsuzaki comprises treatment vat with treatment solution, means for holding the wafer(s) in vertical position and means for reciprocally moving the wafers' holding means with wafer(s) being immersed into the treatment solution. The wafer holding means are moved **reciprocally** up and down by a mechanism with a cylinder and a piston (see Abstract, col.1, lines 6-12; col. 2, lines 15-37; col.3, lines 46-63; col.4, lines 60-65; col.5, lines 58-62; Fig.4 and 5). After completion of liquid treatment in the treatment vat, the wafer is dump rinsed in the rinse vat 16 (col.5, lines 8-12).

The teaching of Komatsuzaki differs from the instant claims by not indicating a specific frequency value of up and down motion. The reciprocal or up and down motion of substrates is known in the art of cleaning semiconductors and utilized among the other procedures for improving the effect of removing foreign materials from substrates' surfaces. Because the reciprocal movement enhances the flow of the cleaning liquid on

or near the surface of the wafer, the frequency of such movement affects the cleaning process, which is provided by Erk.

In addition to other semiconductor cleaning means and techniques, in order to enhance semiconductor cleaning process Erk also utilizes reciprocal motion of wafers. Erk provides the range of reciprocating rates from 20 cycles/min to 240 cycles/min and states that the reciprocating rate affects the processing time (col.6, lines 28-31). Erk also discloses the preferable reciprocating rate of at least 60 cycles/min as one of his processing parameters.

Because the reciprocal motion of the substrate is an important element in treatment techniques of Komatsuzaki and Erk and Erk teaches that the reciprocating rate affects the processing time and, therefore, cleaning results, one skilled in the art at the time the invention was made, motivated by the teaching of Erk would have found it obvious to utilize the preferable reciprocating rate of Erk while optimizing the value of reciprocal frequency and cleaning the wafer in a timely manner in the teaching of Komatsuzaki with the reasonable expectation of success.

The teaching of Komatsuzaki also remains silent about the use of heating means for heating the treatment solution. However, the heating of treatment solutions is widely utilized in the art among the other procedures in order to enhance cleaning efficiency. Thus, Erk also indicates that raising the bath temperature is beneficial for cleaning procedure (col.3, lines 28-29). Therefore the heating means are inherent in the teaching of Erk.

Because both Komatsuzaki and Erk are concerned with liquid treatment of semiconductor wafers and Erk provides for heating of the bath with cleaning liquid, one skilled in the art at the time the invention was made, motivated by the teaching of Erk, would have found it obvious to provide the heating means in the apparatus of Komatsuzaki in order to obtain and maintain the desired temperature of treatment solution, thus effectively wet processing the wafers of Komatsuzaki.

5. Claim 14 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505) and in further view of Handbook of Semiconductor Wafer Cleaning Technology (The Book).

The combined teaching of Komatsuzaki and Erk remains silent about spin drying of wafer(s) after processing. However, the drying of wafers after processing is notoriously used and recognized in the art of semiconductor technology as an extremely critical step, and the spin drying is the most widely utilized drying technique, as provided by the Book (page 24, paragraph 3.5).

Therefore, one skilled in the art, motivated by the teaching of the Book, would have found it obvious to spin dry wafer(s) in the teaching of Komatsuzaki and Erk, after their rinsing, in order to prevent re-deposition of unwanted elements onto the wafer's surfaces and provide for the proper storing.

6. Claim 7 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505) and in further view of Cardani et al. (U.S. 5,003,999).

While teaching the use of heating means, the combined disclosure of Komatsuzaki and Erk remains silent about the utilization of **electrical** heating means. However, conventionally controlled electrical resistors as heating means for liquid processing baths are notoriously utilized in the art of wet processing of semiconductor wafers, as provided by Cardani (paragraph, bridging col.1 and 2).

Therefore, one skilled in the art, motivated by the teaching of Cordani, would have found it obvious to utilize the electrical heating means, as disclosed by Cordani, in order to provide precise and convenient control of temperature of the treatment solution in the teaching of Komatsuzaki and Erk.

7. Claims 8, 10, 11 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505) and in further view of Ward et al. (U.S. 5,988,186).

The combined teaching of Komatsuzaki and Erk does not specifically provide for the stripper solution that comprises DMSO and TMAH. However it indicates that the disclosed apparatus can be used for **any liquid treatment** of any plate like materials, thus motivating the skilled artisan to explore different treatment solutions in semiconductor processing.

Ward teaches an aqueous composition, comprising DMSO and TMAH (see example in paragraph, bridging col.6 and 7), which is useful for treatment wafer

surfaces during the fabrication of integrated circuits (paragraph bridging col.4 and 5; col. 5, lines 3-31). The composition of Ward is non-corrosive, non-flammable and of low toxicity to the environment.

Because both the combined teaching of Komatsuzaki and Erk and Ward are concerned with liquid treatment of semiconductor wafers and Ward provides for the environmentally safe and non-toxic treatment composition, one skilled in the art, motivated by the teaching of Ward, would have found it obvious to utilize the treatment composition of Ward in order to provide non-corrosive and environmentally safe treatment media and treat the wafers in combined teaching of Komatsuzaki and Erk with the reasonable expectation of success.

8. Claims 1-4 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (U.S. 5,992,431) in view of Erk et al. (U.S. 5,593,505) and in further view of Applicants' admittance.

Weber teaches device for treating substrates, such as semiconductor wafers. The device of Weber comprises fluid container (reads on "tank", as instantly claimed) into which liquid chemicals can be introduced (col. 5, lines 29-35), an overflow opening via which the fluid entering the container can flow out (col.8, lines 33-35), wafer receiving device (reads on "wafer holder", as instantly claimed) and means for lifting and lowering or reciprocating vertically the wafer receiving device (col.7, lines 49-53). The liquid media is contained within the fluid container during wafer processing (col.8, lines 17-35). Therefore, the device of Webber is fully capable of holding, immersing and reciprocating at least one wafer being in vertical position. The device of Weber also

comprises heating means for heating the fluid contained in said fluid container (col.6, lines 38-41).

The teaching of Weber differs from the instantly claimed by not indicating a specific frequency value produced by reciprocating means and utilized for reciprocating the wafer receiving device.

The apparatuses for wet treatment of semiconductor substrates comprising the reciprocated motion of substrate holder are known and utilized in the art because the reciprocal movement enhances the flow of the cleaning liquid on or near the surface of the substrate and the frequency of such movement affects the cleaning process, which is provided by Erk.

In addition to other structural elements of his apparatus, in order to enhance semiconductor cleaning Erk utilizes means for reciprocal motion of wafers. Erk provides the range of reciprocating rates from 20 cycles/min to 240 cycles/min and states that the reciprocating rate affects the processing time (col.6, lines 28-31). Erk also discloses the preferable reciprocating rate of at least 60 cycles/min as one of his processing parameters.

Because the substrate reciprocal motion means are important elements of the apparatuses of Weber and Erk and Erk teaches that the reciprocating rate affects the processing time and, therefore, cleaning results, one skilled in the art at the time the invention was made, motivated by the teaching of Erk would have found it obvious to utilize the range of reciprocating rates of Erk in order to accelerate wafer cleaning in apparatus of Webber with the reasonable expectation of success. The apparatus of

Weber and Erk is fully capable of providing reciprocating rate in the range of 100 cycles/min or less.

In regard to claims 3 and 4, which are concerned with specific design of wafer holders, it is noticed here that the claimed wafer holders are typical holders, commonly and widely used in the art (paragraph, bridging pages 16 and 16 of the instant disclosure). Therefore, one skilled in the art would have found it obvious to utilize the conventional wafer holders in the apparatus of Weber and Erk in order to provide economical and technologically compatible equipment for semiconductor wafer(s) treatment.

9. Claims 12, 13, 16, 17 and 20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki and Erk, as discussed above and in view of Noguchi (U.S. 4,657,631).

The combined teaching of Komatsuzaki and Erk does not specifically indicates the step of stationary soaking of the wafer in treatment solution.

Noguchi teaches removal of a solid layer of photosensitive material from the substrate surface by stationary soaking the substrate in a liquid, which is capable of dissolving the photosensitive solid layer followed by agitation of the substrate in order to accelerate the removal process.

Because the combined teaching of Komatsuzaki and Erk and Noguchi are both concerned with liquid treatment of substrates and Noguchi provides for the acceleration of treatment by stationary soaking the substrate in a processing liquid, one skilled in the art motivated by the disclosure of Noguchi would have found it obvious to soak the

substrate in the process of Komatsuzaki and Erk separately from its agitation in order to process the substrate in a timely manner.

In regard to soaking time, it is noted that this parameter is result effective, because the required dissolving or, alternatively, swelling of the removable layer depends on the characteristics of this particular layer, applied solution and on the duration of dissolution or swelling step. However, discovery of optimum value of result effective variable in known process is ordinarily within the skill in the art and would have been obvious, consult ***In re*** Boesch and Slaney 205 USPQ 215 (CCPA 1980).

10. Claim 18 stands rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki, Erk and Noguchi (U.S. 4,657,631) and in further view of Applicants' admittance.

The combined process of Komatsuzaki, Erk and Noguchi does not specifically provide for the stripper solution that comprises DMSO. However it indicates that the disclosed wafer processing can be utilized for **any type of liquid treatment** of any plate like materials, thus motivating the skilled artisan to explore different treatment solutions in semiconductor processing.

Regarding the use of solution, which comprises DMSO, it is noticed here that solutions containing DMSO are conventionally utilized in wet dip processing, as instantly indicated by Applicants on page 2, first paragraph. Therefore, one skilled in the art would have found it obvious to utilize the conventional biodegradable and non toxic processing solution, containing DMSO for substrate treatment in the combined teaching of Komatsuzaki and Erk, and Noguchi with the reasonable expectation of success.

11. Claim 19 stands rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki, Erk, and Noguchi, as discussed above and in further view of Handbook of Semiconductor Wafer Cleaning Technology (The Book).

The combined teaching of Komatsuzaki, Erk and Noguchi remains silent about spin drying of wafer(s) after processing. However, the drying of wafers after processing is notoriously used and recognized in the art of semiconductor technology as an extremely critical step, and the spin drying is the most widely utilized drying technique, as provided by the Book (page 24, paragraph 3.5).

Therefore, one skilled in the art, motivated by the Book, would have found it obvious to spin dry wafer(s) in the teaching of Komatsuzaki, Erk and Noguchi, after their rinsing, in order to prevent re-deposition of unwanted elements onto the wafer's surfaces and provide for the proper storing.

12. The rejection of claim 17 under 35 U.S.C. 112, second paragraph is withdrawn in view of clarifications, provided in Paper No.3. However, this claim can not be allowed as requested by Applicants in view of its rejection, as provided above.

Response to Arguments

13. Applicant's arguments filed 01/27/2003 have been fully considered but they are not persuasive.

Applicants argue that there is no motivation to combine references to Komatsuzaki and Erk.

In response to applicant's argument, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, both Erk and Komatsuzaki teach wet chemical treatment of semiconductor substrates and both teachings comprise the same process enhancement technique, namely the reciprocal motion of the substrate positioned in the processing liquid. Erk states that the reciprocating rate affects semiconductor processing time and that sufficient reciprocating rate leads to accelerated cleaning, therefore exposure to other treatment tools (techniques) can be minimized (col.6, lines 28-37). Erk also discloses the preferable reciprocating rate of at least 60 cycles/min as one of his processing parameters. Therefore, one skilled in the art at the time the invention was made, motivated by the teaching of Erk would have found it obvious to utilize the preferable reciprocating rate of Erk in order to accelerate treatment of semiconductor substrate in the teaching of Komatsuzaki with the reasonable expectation of success.

The detailed rationale of combining these references is provided in paragraph 4 of this Office Action.

Applicants also argue that Erk does not teach a method in which a wafer is **completely** immersed in a stripper solution.

In response to this argument, Applicants are kindly advised that the reference to Erk is not used as the primarily reference, but as the secondary reference in order to remedy the deficiency of the primarily reference to Komatsuzaki.

It is also noted that the features upon which applicant relies (i.e., **completely** immersing) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicants traverse rejection of claims 1-4 stating that reference to Weber does not teach a wet stripping apparatus, wherein "said at least one wafer immersed in said stripper solution" and it would be impossible to spray the fluid onto the wafers if the container is full of fluid.

In response to this Applicants are kindly referred to the cleaning apparatus of Weber, which comprises fluid container (reads on "tank", as instantly claimed) into which liquid chemicals can be introduced, an overflow opening via which the fluid entering the container can flow out, wafer receiving device (reads on "wafer holder", as instantly claimed) and means for lifting and lowering or reciprocating vertically the wafer receiving device. **The liquid media is contained within the fluid container during wafer processing**. Therefore, the device of Webber is fully capable of holding, immersing and reciprocating at least one wafer being in vertical position. Applicants' attention is drawn to the fact that the apparatus, not process is recited in claims 1-4. Apparatus claims must be structurally distinguishable from the prior art in terms of

structure not function. ***In re Danley***, 120 USPQ 528, 531 (CCPA 1959); Hewlett-Packard Co. V. Baush and Lomb, Inc., 15 USPQ2nd 1525, 1528 (Fed. Cir. 1990);

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (703) 305-0400. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (703) 308-4333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872 9310 for regular communications and (703) 872 9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308 2450.

Michael Kornakov
Examiner
Art Unit 1746

MK

April 1, 2003

RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
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